

REMARKS

Reconsideration and allowance are respectfully requested.

The specification has been amended to incorporate the proper headings under rule 37 CFR 1.97.

Attached hereto are amended drawings which incorporate the reference characters 124 (Fig. 1), 45 (Fig. 2), and 34 (Fig. 2A) as requested.

The claims have been amended to better clarify the present invention and to give distinction to the language related to the many references cited. Claim 21 is cancelled.

The present invention is directed to annular prefilms 68, 72 (Page 6 lines 15-16) of a fuel injection arrangement which are configured such that, when operatively working with the fuel injection arrangement, fuel flows over the radially inner and radially outer surfaces 80, 82 and 81, 83 respectively (Page 9 line 16, Page 6 line 16 and Fig. 2) to the downstream edge 44. Simultaneously, air flows radially inwardly and radially outwardly of the annular prefilms 68, 72 (Page 6 lines 1-4 and Fig. 2 noting air swirlers 18 and 20 are radially inward and radially outward of the fuel injector of prefilmer 68) via a fluid flow mixing means 34 comprising an array of lands 84 which are disposed on the surface 81, 83 over which the fuel flows (Page 9 lines 15-20) as expressly claimed in currently amended claim 1.

The patents to JOSHI et al. (US 5638682 & US 5251447) disclose an injector with inner and outer swirlers, an air/fuel mixer 24 and a mixing duct 37. The outer swirler includes vanes which comprise fuel outlet holes to eject liquid fuel into the swirling air flow. High pressure air is injected into the mixing duct 37 through the swirlers to form an intense shear region. Fuel is then injected into the mixing duct allowing the high pressure air and the fuel to uniformly mix therein. Slots are provided at the downstream end of the mixing duct comprising flares which allow the premixed fuel/air flow to expand into the combustion chamber 14 at a quicker rate. Therefore, JOSHI et al. fails to disclose a mixing duct acting as an annular prefilmer from which fuel flows. Additionally, JOSHI et

al. fail to disclose a fluid flow mixing means disposed to the surface over which the fuel flows and configured to break up the fuel into smaller particles for quicker vaporization in order to reduce the net heat release fluctuations within the combustor (Page 8 lines 14-31). Furthermore, JOSHI et al. does not disclose the arrangement wherein air flows radially outwardly of the annular prefilmer as expressly claimed in currently amended claim 1.

VICKERY (US 2982098) discloses a liquid fuel vaporizing injector. In operation, air at high velocity is supplied to the combustion chamber wherein a major portion is by-passed around the primary combustion zone to provide dilution air downstream and simultaneously combustion supporting air is introduced through the air inlet holes 22. The fuel/air mixture is received into the primary combustion zone and ignited. Liquid fuel is introduced into the annulus 27 under pressure and flows downstream picking up heat as it flows. Corrugations 32 are fully exposed to the heat of combustion so that as the fuel/air mixture passes through slots 30 and reverses its direction to pass upstream towards the outlets 34 the fuel is vaporized (Col. 3 lines 15-34). Thus, VICKERY fails to disclose a prefilmer, and more importantly, air flowing radially inwardly and radially outwardly of a prefilmer characterised in that the prefilmer further comprises a fluid flow mixing means disposed to the surface over which the fuel flows as expressly claimed in currently amended claim 1.

The patent to CHYOU et al. (US 5498155) discloses a fuel mixer where combustion air guided by vortex generators 9 is supplied to a combustion chamber duct 20. Fuel is introduced into the duct 20 close to the vortex generators 9 wherein the vortex generators include 3 surfaces in order to thoroughly mix the combustion air and the fuel within a short distance. Thus, CHYOU et al. fails to disclose an annular prefilmer having radially inner and radially outer surfaces wherein air flows radially inwardly and radially outwardly of the prefilmer as expressly claimed in currently amended claim 1.

MARKOWSKI et al. (US 3974646) discloses an arrangement where a portion of the exhaust gases are passed into a pilot zone chamber where fuel is added for vaporization therewith. However, the fluid flow mixing means 60 of

MARKOWSKI et al. are disposed on an air flow duct 26, whereas the present invention disposes the fluid flow mixing means to the surface over which the fuel flows as expressly claimed in currently amended claim 1.

Regarding the 103 rejection based on the patents to CROCKER et al. (US 6272840) and MARKOWSKI et al. (US 4260367), neither CROCKER et al. nor MARKOWSKI et al. teach disposing the fluid flow mixing means to the surface over which the fuel flows as claimed in currently amended claim 1 of the present invention. The arrangement of MARKOWSKI et al. utilizes further vortex generators forcing vortices into an air stream which mixes with a film of fuel issued from the downstream edge of CROCKER et al.'s prefilmer. Therefore, the combination of CROCKER et al. and MARKOWSKI et al. would not result in the present invention.

The patents to YOUNG et al. (US 3153319) and LARSON et al. are directed to the suppression of jet noise whereas the invention to MARKOWSKI et al. (3974646) and each of the other references cited are directed to problems associated with combustion instabilities. Therefore, one skilled in the art would not look to YOUNG et al. or LARSON et al. in view of MARKOWSKI et al. and any other reference mentioned above due to significant operational differences. Furthermore, neither YOUNG et al. nor LARSON et al. disclose the fluid flow mixing means being disposed to the surface over which the fuel flows as claimed in currently amended claim 1.

Entry of this amendment is solicited, is believed appropriate, and is believed to distinguish the invention from the cited references. For the foregoing reasons, reconsideration and allowance are believed in order and are solicited.

Respectfully submitted,

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Replacement Sheet

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Fig.2.

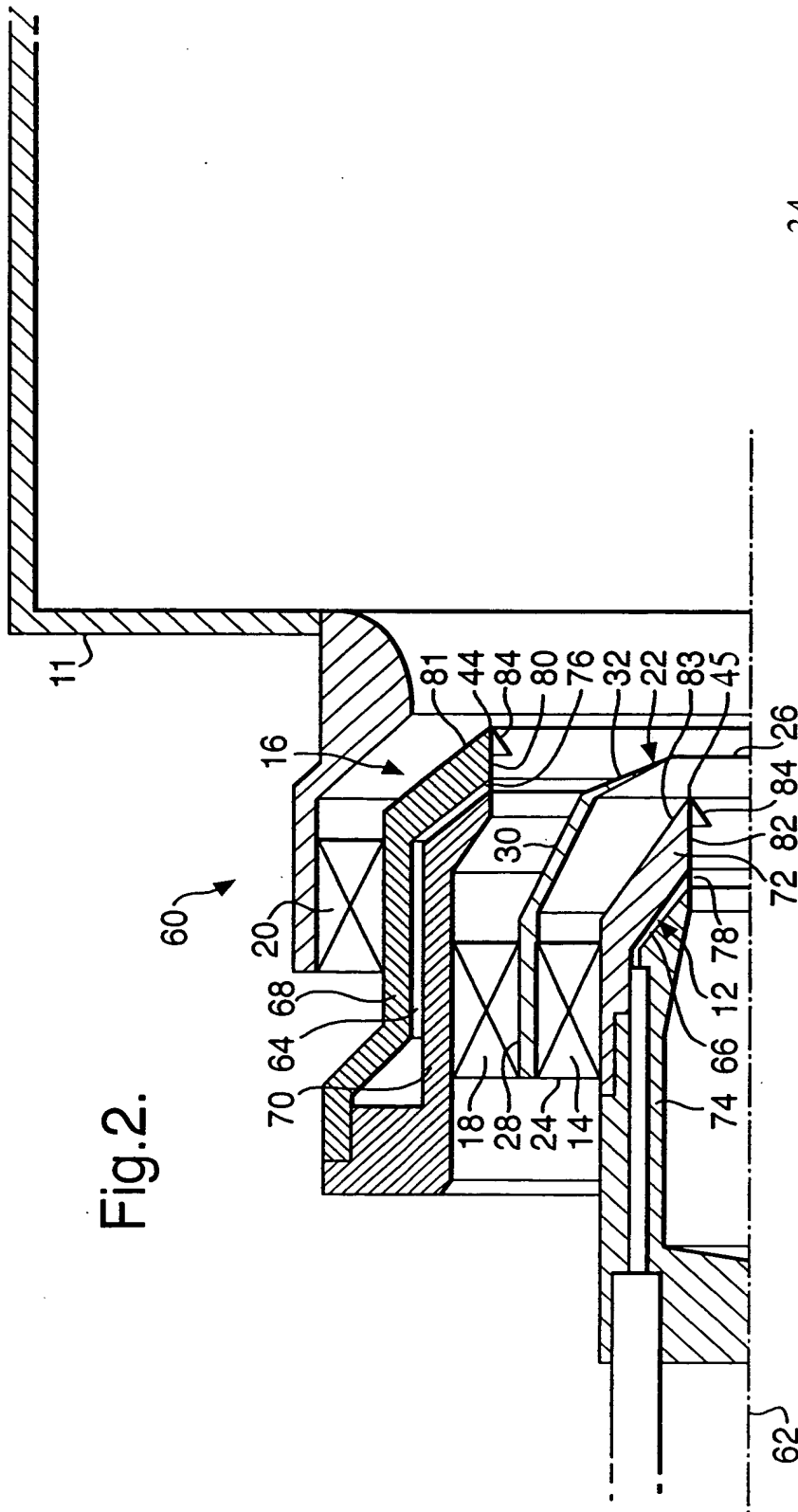


Fig.2A.

